

ELEC ENG 2CI5
Introduction to Electrical Engineering

COURSE OUTLINE

Please refer to course website for updated information.

COURSE DESCRIPTION

Current, potential difference; Kirchhoff's laws; Ohm's Law; circuit elements; mesh/nodal analysis of electrical circuits; first and second order circuits; complex arithmetic; phasors, impedance and admittance; AC power.

PRE-REQUISITES AND ANTI-REQUISITES

Prerequisite(s): Registration in a Computer Engineering or Electrical Engineering program
 Antirequisite(s): ELEC ENG 2CI4

SCHEDULE

Lectures:	Mondays and Thursdays 9:30 am, Tuesdays 10:30 a.m.	JHE-376
Tutorials:	Wednesdays 12:30 p.m. Thursdays 11:30 am	HH-302 MDCL1309
Laboratories:	L01 Mondays 2:30 - 5:30 p.m. L02 Tuesdays 2:30 - 5:30 p.m. L03 Wednesdays 2:30 - 5:30 p.m. L04 Thursdays 2:30 - 5:30 p.m. L05 Fridays 2:30 - 5:30 p.m. L06 Mondays 5:30 - 8:30 p.m. L07 Tuesdays 5:30 – 8:30 p.m. L08 Wednesdays 5:30 – 8:30 p.m.	ITB-A114

INSTRUCTOR

Dr. Mohamed Bakr
 Email: mbakr@mcmaster.ca
 Office: ITB-A219
 Phone: 905-525-9140 ext. 24079
 Office Hours: Mondays -Thursdays 2:30pm - 3:20pm ; and by appointment

TEACHING ASSISTANTS

Contact information and office hours are provided on Avenue.

- Hassan Aleian
- Mohammed Bagheri
- Mina Naguib
- Diego Valencia Garcia
- Ying Chen
- Mistry Jigar
- Majeed Khaqan
- Ayman Negm
- Ahmed Salem
- Mohamed Abdalmagid
- Mohamed Ibrahim

COURSE WEBSITE/S

Course materials will be posted on Avenue to Learn (<http://avenue.mcmaster.ca/>)

COURSE OBJECTIVES

By the end of this course, students should be able to:

- Analyze circuit systems using nodal analysis and/or mesh analysis.
- Be able to interpret analytical results and assign properly powers, currents and voltages to circuit elements.
- Explain the characteristics of resistors, capacitors and inductors.
- Compute time response of first-order RC and RL circuits.
- Analyze RLC circuits using phasor techniques and interpret analytical results and assign properly powers, currents and voltages to circuit elements.
- Work in a group in an effective and efficient manner in order to achieve goals of assigned laboratory work.
- Clearly communicate engineering design work in both written and oral formats.
- Understand sustainability aspect and its relation to power engineering systems.

ASSUMED KNOWLEDGE

Linear algebra, basic complex algebra, first-order differential equations

COURSE MATERIALS

Required Texts:

Basic Engineering Circuit Analysis (11th Ed.) by J. David Irwin and R. Mark Nelms, Wiley.
 Analog Discovery 2 Laboratory Experiments Courseware

Calculator:

Only the Casio FX-991 MS or MS Plus Calculator will be permitted in tests and examinations.

Other

Analog Discovery 2 Board

Videos are available through Dr. Bakr's YouTube Channel:

http://www.youtube.com/channel/UCFQ_5eallhvHplhf9pdsVsw

COURSE OVERVIEW

Weeks	Topics	Textbook
1	Charge, current and voltage. Voltage and current sources.	Chapter 1
2-3	Resistive circuits, Ohm's law, parallel and series circuits, voltage and current dividers, wye and delta circuits.	Chapter 2
4-5	Nodal and loop analysis techniques, Kirchhoff's laws.	Chapter 3
6-7	Superposition techniques in linear circuits. Thevenin and Norton equivalent circuits. Power transfer.	Chapter 5
8-9	Capacitance and inductance, energy storage, integrator and differentiator circuits	Chapter 6
10	Transient circuit analysis	Chapter 7
11-12	AC steady-state analysis, phasors, power relationships.	Chapter 8

A more detailed time line is available on Avenue.

At certain points in the course it may make good sense to modify the schedule. The instructor may modify elements of the course and will notify students accordingly (in class, on Avenue).

LABORATORY OVERVIEW

Week	Topic
4	Laboratory safety
5	Introduction to instrumentation
6	Resistive circuits
7	Thevenin equivalent circuits

8	RC circuits
9	RL circuits
10	Introduction to PSpice
11	RLC resonant circuits in PSpice
12	Make-up lab (requires permission from instructor)

LABORATORY OPERATION

- At the beginning of every term, every Undergraduate student using an ECE Lab is required to complete the ECE Lab Safety Quiz (one completed quiz covers every course that term). The quiz and other information is provided on the webpage: <https://www.eng.mcmaster.ca/ece/resources#health-safety>
- Access to all labs is restricted in the interest of security and safety. Information on accessing and using the lab can be found on the webpage: <https://www.eng.mcmaster.ca/ece/labs-and-health-safety#Labs-Access-and-Use>
- Please obtain your own Access Card for use during regular building hours / The TA will open the lab at regularly scheduled lab times
- The labs for this course will be held in ITB-A114
- Each lab will involve a significant amount of pre-lab work. You may submit one pre-lab report per group.
- The pre-lab work will be assessed at the beginning of the lab.

ASSESSMENT

Component	Weight
Laboratories	20%
Two Midterm Tests	30%
Quizzes/Attendance	10%
Final Examination	40%
Total	100%

Students are expected to attend all lectures and tutorials, as well as their assigned laboratory section. Students will be responsible for all material covered in these venues.

ACCREDITATION LEARNING OUTCOMES

Note: The *Learning Outcomes* defined in this section are measured throughout the course and form part of the Department's continuous improvement process. They are a key component of the accreditation process for the program and will not be taken into consideration in determining a student's actual grade in the course. For more information on accreditation, please ask your instructor or visit: <http://www.engineerscanada.ca> .

Outcomes	Indicators	Measurement Methods(s)
Use mathematics, circuit laws and network theorems to analyze and solve problems in simple and complex D.C. circuits.	1.1, 2.2	Exams
Describe the principles of inductance and capacitance and explain their effects on circuit performance.		Exams
Solve problems in determining charge magnitude, timing and transient response in both inductive and capacitive circuits.	3.1	Exams
Safely use test equipment commonly found in industry for the measurement of electrical circuit parameters.	11.2	Labs
Use theoretical basis to propose simple circuit design and test the performance in the laboratory setting	7.3, 9.3	Labs

ACADEMIC INTEGRITY

You are expected to exhibit honesty and use ethical behaviour in all aspects of the learning process. Academic credentials you earn are rooted in principles of honesty and academic integrity.

Academic dishonesty is to knowingly act or fail to act in a way that results or could result in unearned academic credit or advantage. This behaviour can result in serious consequences, e.g. the grade of zero on an assignment, loss of credit with a notation on the transcript (notation reads: "Grade of F assigned for academic dishonesty"), and/or suspension or expulsion from the university.

It is your responsibility to understand what constitutes academic dishonesty. For information on the various types of academic dishonesty please refer to the Academic Integrity Policy, located at www.mcmaster.ca/academicintegrity.

The following illustrates only three forms of academic dishonesty:

- Plagiarism, e.g. the submission of work that is not one's own or for which other credit has been obtained.
- Improper collaboration in group work.
- Copying or using unauthorized aids in tests and examinations.

ACADEMIC ACCOMMODATIONS

Students with disabilities who require academic accommodation must contact Student Accessibility Services (SAS) to make arrangements with a Program Coordinator. Student Accessibility Services can be contacted by phone 905-525-9140 ext. 28652 or e-mail

sas@mcmaster.ca . For further information, consult McMaster University's Academic Accommodation of Students with Disabilities policy.

Students requiring academic accommodation based on religious, indigenous or spiritual observances should follow the procedures set out in the RISO policy. Students requiring a RISO accommodation should submit their request to the Engineering Student Services office normally within 10 working days of the beginning of term in which they anticipate a need for accommodation or to the Registrar's Office prior to their examinations.

Students should also contact their instructors as soon as possible to make alternative arrangements for classes, assignments, and tests.

STUDENT ABSENCE AND SUBMISSION OF REQUEST FOR RELIEF FOR MISSED ACADEMIC WORK

In the event of an absence for medical or other reasons, students should review and follow the Academic Regulation in the Undergraduate Calendar "Requests for Relief for Missed Academic Term Work".

EXTREME CIRCUMSTANCES

The University reserves the right to change the dates and deadlines for any or all courses in extreme circumstances (e.g., severe weather, labour disruptions, etc.). Changes will be communicated through regular McMaster communication channels, such as McMaster Daily News, A2L and/or McMaster email.

www.eng.mcmaster.ca/ece

Electrical and Computer Engineering Lab Safety

Information for Laboratory Safety and Important Contacts

This document is for users of ECE instructional laboratories in the Information Technology Building.

This document provides important information for the healthy and safe operation of ECE instructional laboratories. This document is required reading for all laboratory supervisors, instructors, researchers, staff, and students working in or managing instructional laboratories in ECE. It is expected that revisions and updates to this document will be done continually. A McMaster University lab manual is also available to read in every laboratory.

General Health and Safety Principles

Good laboratory practice requires that every laboratory worker and supervisor observe the following:

1. Food and beverages are not permitted in the instructional laboratories.
2. A Laboratory Information Sheet on each lab door identifying potential hazards and emergency contact names should be known.
3. Laboratory equipment should only be used for its designed purpose.
4. Proper and safe use of lab equipment should be known before using it.
5. The course TA leading the lab should be informed of any unsafe condition.
6. The location and correct use of all available safety equipment should be known.
7. Potential hazards and appropriate safety precautions should be determined, and sufficiency of existing safety equipment should be confirmed before beginning new operations.
8. Proper waste disposal procedures should be followed.

Location of Safety Equipment

Fire Extinguisher

On walls in halls outside of labs

First Aid Kit

ITB A111, or dial "88" after 4:30 p.m.

Telephone

On the wall of every lab near the door

Fire Alarm Pulls

Near all building exit doors on all floors

Who to Contact

Emergency Medical / Security: On McMaster University campus, call Security at extension **88** or **905-522-4135** from a cell phone.

Non-Emergency Accident or Incident: Immediately inform the TA on duty or Course Instructor.

University Security (Enquiries / Non-Emergency): Dial 24281 on a McMaster phone or dial 905-525-9140 ext. 24281 from a cell phone.

See TA or Instructor: For problems with heat, ventilation, fire extinguishers, or immediate repairs

Environmental & Occupational Health Support Services (EOHSS): For health and safety questions dial 24352 on a McMaster phone or dial 905-525-9140 ext. 24352 from a cell phone.

ECE Specific Instructional Laboratory Concerns: For non-emergency questions specific to the ECE laboratories, please contact 24103.

In Case of a Fire (Dial 88)

When calling to report a fire, give name, exact location, and building.

1. Immediately vacate the building via the nearest Exit Route. Do not use elevators!
2. Everyone is responsible for knowing the location of the nearest fire extinguisher, the fire alarm, and the nearest fire escape.
3. The safety of all people in the vicinity of a fire is of foremost importance. But do not endanger yourself!
4. In the event of a fire in your work area shout "*Fire!*" and pull the nearest fire alarm.

5. Do not attempt to extinguish a fire unless you are confident it can be done in a prompt and safe manner utilizing a hand-held fire extinguisher. Use the appropriate fire extinguisher for the specific type of fire. Most labs are equipped with Class A, B, and C extinguishers. Do not attempt to extinguish Class D fires which involve combustible metals such as magnesium, titanium, sodium, potassium, zirconium, lithium, and any other finely divided metals which are oxidizable. Use a fire sand bucket for Class D fires.
6. Do not attempt to fight a major fire on your own.
7. If possible, make sure the room is evacuated; close but do not lock the door and safely exit the building.

Clothing on Fire

Do not use a fire extinguisher on people

1. Douse with water from safety shower immediately or
2. Roll on floor and scream for help or
3. Wrap with fire blanket to smother flame (a coat or other nonflammable fiber may be used if blanket is unavailable). Do not wrap a standing person; rather, lay the victim down to extinguish the fire. The blanket should be removed once the fire is out to disperse the heat.

Equipment Failure or Hazard

Failure of equipment may be indicative of a safety hazard - You must report all incidents.

Should you observe excessive heat, excessive noise, damage, and/or abnormal behaviour of the lab equipment:

1. Immediately discontinue use of the equipment.
2. In Power Lab, press wall-mounted emergency shut-off button.
3. Inform your TA of the problem.
4. Wait for further instructions from your TA.
5. TA must file an incident report.

Protocol for Safe Laboratory Practice

Leave equipment in a safe state for the next person - if you're not sure, ask!

In general, leave equipment in a safe state when you finish with it. When in doubt, consult the course TA.

Defined Roles

TA	The first point of contact for lab supervision	
ECE Lab Supervisor	Steve Spencer- ITB 147	steve@mail.ece.mcmaster.ca
ECE Course Instructor	Please contact your specific course instructor directly	
ECE Administrator	Kerri Hastings- ITB A111	hastings@mcmaster.ca
ECE Chair	Tim Davidson- ITB A111	davidson@mcmaster.ca